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Human Papillomavirus (HPV) Vaccination and Cervical Cancer Prevention: Ghanaian Adolescent Students' Perspectives Through Focus Group Discussion

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Abstract: Human Papillomavirus (HPV) vaccine effectively reduces HPV-related cancers. Understanding the primary target populations' perceptions of HPV vaccination is critical. We examined the perspectives of Ghanaian adolescent students on HPV vaccination. We conducted four focus group discussions among students from Junior High and Senior High Schools in the Ashanti Region of Ghana. Ten open-ended questions guided the discussions. Two independent coders transcribed and analyzed the data thematically using NVivo software. Fifty-nine students (mean age: 14.97 years, SD = 1.55) participated in the study. Themes emerged from the discussions included: (a) low knowledge of HPV vaccines but a strong understanding of the benefits of vaccines. (b) Barriers to accepting HPV vaccine include perceived side effects (e.g., pain, fear of injection, potential death), misconceptions (e.g., infertility, "destroying the womb," growing lean), and vaccine cost. (c) Facilitators to accepting vaccines include vaccine effectiveness, normative beliefs (e.g., parents, doctors, and friends), exposure to school-based vaccine education (e.g., seminars), and altruistic reasons (e.g., protecting others from infection). (d) No adolescent-parent communication, but adolescents indicated a willingness to communicate with parents when received accurate information. These findings underscore the need for targeted HPV education campaigns to improve vaccine uptake.

Keywords: HPV vaccine; cervical cancer prevention; adolescents; vaccine barriers; vaccine facilitators; adolescent parent communication

1. Introduction

Human Papillomavirus (HPV) presents a significant global health threat, especially in Low- and Middle-Income Countries (LMICs) like Ghana. HPV is a leading cause of cervical cancer, and it is responsible for over 95% of annual cervical cancer diagnoses [1,2]. Globally, cervical cancer is the fourth most common cancer affecting women and is responsible for over 300,000 deaths annually [3]. More than 85% of these deaths occur in LMICs due to limited access to preventive care and treatment options [3]. Unfortunately, a woman dies of cervical cancer every two minutes, with a staggering 90% of these deaths happening in LMICs [4,5]. In Ghana, cervical cancer is the leading cause of cancer-related deaths among women. As of 2020, the disease had an incidence rate of 27.4 per 100,000 women and resulted in about 2,200 deaths [1,6–9].

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HPV vaccines have demonstrated high efficacy in preventing HPV infections [10]. Currently, six licensed HPV vaccines are available globally: three bivalents (Cervarix, Walrinvax, Cecolin), two quadrivalent (Gardasil, Cervavac), and one nonvalent (Gardasil 9). These vaccines have shown strong efficacy against HPV types 16 and 18, which cause most cervical cancers [11]. The HPV vaccination schedule varies across countries depending on the recipient's age. In the United States (US), the primary target group for HPV vaccination is young adolescents aged 9 to 12 [12]. Catch-up vaccinations are recommended for individuals up to age 26 [12]. Adults aged 27 to 45 may also consider getting the HPV vaccine after discussing their specific risks and benefits with a healthcare provider [12]. The World Health Organization (WHO) recommends one or two doses for girls aged 9 to 14, one or two doses for girls and women aged 15 to 20, and two doses with a six-month interval for women older than 21. For individuals known to be immunocompromised or HIV-infected, a minimum of two doses is required, with three doses recommended when feasible [8,13]. In a significant development, the WHO recently approved Cecolin® for a single-dose vaccination schedule, which could significantly increase vaccine accessibility in LMICs [14]. However, challenges persist, including high rates of late-stage diagnosis and limited access to treatment, which remain barriers to improving survival outcomes [15,16]. Other general barriers to HPV vaccine uptake in LMICs include limited public awareness [17], misinformation regarding vaccine safety, and myths about potential side effects [18]. Additionally, cultural and religious beliefs surrounding sexual health contribute to low acceptance rates, with misconceptions persisting, such as the belief that only girls need the vaccine. This perception overlooks the importance of vaccinating boys to prevent HPV-related cancers, such as penile and throat cancers, and to reduce overall transmission [18]. Structural barriers, including high vaccine costs, lack of government-mandated programs, and insufficient healthcare infrastructure, also restrict access, especially in rural areas where reliance on NGOs and limited government initiatives has been inadequate to reach the necessary levels of vaccine coverage [19,20].

In recent years, Ghana has been making advances in addressing cervical cancer. A three-dose HPV vaccination schedule was piloted for girls aged 10–14 in four districts in Ghana in 2013 and 2015 [21]. Since those years, various types of HPV vaccines have been on the market, but they have yet to be introduced as part of Ghana's national routine immunization program. Additionally, in 2021, Ghana established a national cancer registry to enhance cancer surveillance, aid vaccination, and early detection, and provide critical data for prevention strategies [6]. Ghana's efforts in preventing cervical cancer through vaccination and early detection (i.e., screening) aligned with the WHO's global 90/70/90 triple cervical cancer elimination intervention strategy launched in November 2020 [6,9]. The strategy aims to eliminate cervical cancer as a public health issue by vaccinating 90% of girls against HPV by age 15, screening 70% of women with high-performance tests by ages 35 and 45, and treating 90% of detected precancerous lesions and cancers [6,9]. In a recent development, Ghana is planning to make HPV vaccination available nationwide and adopt a single-dose vaccine strategy to simplify logistics and increase vaccine coverage in the country [21]. However, little is known about Ghanaian adolescents' perspectives and attitudes toward HPV vaccination, who are the primary target of the various HPV vaccine initiatives. We examined the perceptions of Ghanaian adolescent students on HPV vaccination and its role in preventing cervical cancer. The findings aim to support strategies to improve vaccine acceptance and reduce HPV-related cancer incidence in Ghana.

2. Materials and Methods

2.1. Study Setting and Participant Recruitment

We recruited adolescents from four (Junior High and Senior High) schools in the Ashanti Region of Ghana to participate in focus group discussions. For confidentiality and to protect the identities of the participating institutions, the four schools involved in this study are referred to as Schools A (Senior High School), School B (Junior High School), School C (Junior High School), and School D (Senior High School). These pseudonyms are assigned sequentially based on the order in which the focus group discussions were conducted, ensuring that the schools remain anonymous while

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maintaining clarity and consistency in reporting the findings. The Institutional Review Boards of both Baylor University in the US and Kwame Nkrumah University of Science and Technology in Ghana first approved the study protocol. Afterward, additional approvals were obtained from the Ghana Education Service (GES) and the administrators of the participating schools. We collaborated with these school administrators to recruit students, following parental permission. A total of four focus group discussions (to reach conceptual saturation), one at each school, were conducted with 59 adolescent students.

2.2. Eligibility Criteria

Eligible participants were adolescents enrolled in the four schools, were between 11 and 18 years of age, could read or understand English, and obtained parental permission.

2.3. Focus Group Discussion (FGD) Procedure

Parental permission and participants' assent were obtained before the start of the focus group discussions (FGDs) and questioning. They were informed that the sessions would be recorded, and their responses would be used in a study to assess knowledge about HPV vaccination and cancer prevention. Each participant was assigned a number, which they were instructed to state before responding to any questions during the discussion. The discussions were conducted in a round-robin format, ensuring that every participant had an equal opportunity to contribute. A moderator facilitated the discussions, which lasted between 50 and 60 minutes depending on participant engagement, and all sessions were recorded. As compensation for their time, each participant received 20 Ghana cedis.

2.4. Measures

A semi-structured interview guide was developed to facilitate the focus group discussions. This guide was designed to gather information from participants on several key areas, including their general knowledge of HPV and cervical cancer, perceptions of HPV vaccination, barriers and facilitators to accessing vaccination centers and healthcare, and their willingness to get vaccinated.

2.5. Data Analysis

The demographic characteristics of the participants were analyzed using SAS software (version 9.4). The data were first cleaned and prepared for analysis, ensuring accurate categorization of key variables such as gender, age, insurance status, provider access, and religious affiliation. Frequencies and percentages were calculated for categorical variables (e.g., gender, insurance status, provider access, and religion), while the mean was used to describe continuous variables like age. The results of this analysis are summarized in Table 1, which provides a detailed breakdown of participant demographics.

All discussion responses were recorded and transcribed verbatim for analysis. We used NVivo software (version 14) to analyze the transcribed data, with responses from each school stored in a separate file. We employed both deductive and inductive approaches in our analysis. First, we conducted a deductive analysis [22–24], where key themes such as knowledge of HPV and vaccination, perceptions of healthcare, barriers and facilitators, and HPV information sources, were pre-determined based on existing literature. This allowed us to structure the initial analysis around these main areas of interest. Following this, we used an inductive approach [25–27] where sub-themes and codes emerged naturally from the participants' responses. This flexible, data-driven process enabled us to capture insights that were not anticipated in the initial deductive framework, ensuring that we addressed both expected and unexpected findings in the participants' perspectives. We systematically coded text snippets from the discussions into these emerging themes for a more comprehensive understanding of the data.

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Table 1. Sociodemographic characteristics of participants.

Characteristics	Number (n=59)	Percent (%)
Gender		
Female	50	15.25
Male	9	84.75
Insurance		
Yes	59	100.00
Provider Access		
Yes	15	25.42
No	44	74.58
Religion		
Christian	54	91.53
Muslim	3	5.08
None	2	3.39
Age range	12 – 17years	
Mean Age (SD)	14.97 (SD $\pm$ 1.55) years	

Two independent coders (EA and AE) independently read the transcripts of all four files and identified common sub-themes independently. Text snippets from the responses were thematically coded for all four files. When there were disagreements in themes from the independent coders, the two coders reached a consensus on the coding themes. A third independent coder came in to verify the validity of the analysis codes. A coding comparison query was run, and the intercoder unweighted kappa score was 0.65, signifying an acceptable agreement between coders and suggesting a reliable level of consistency in the coding process [28,29].

3. Results

2.1. Demographic Characteristics

A total of 59 students participated in the study, including students from school A (n = 15), school B (n = 20), school C (n = 10), and school D (n =14). Most participants were female (84.75%), with only 15.25% being male. All participants reported having insurance coverage (100%), but 25.42% of the participants stated that they had access to a primary healthcare provider. Majority of the participants identified as Christian (91.51%), followed by Muslim participants (5.08%), and a small percentage (3.39%) reported no religious affiliation. The participants' age ranges from 12 to 17, with a mean age of 14.97 (SD + 1.55) years. The basic demographic characteristics of the participants are described in Table 1.

3.2. Main Findings

The focus group discussions centered on the participants' knowledge of Human Papillomavirus (HPV), general knowledge of cervical cancer, vaccination, HPV vaccine facilitators, and barriers and sources of HPV vaccine information. Table 2 summarizes the interview themes, subthemes, and direct participant quotes. In the results section, references to specific quotes in the table are indicated by numbers, letters, and Roman numerals mentioned in the text.

Table 2. Interview themes and quotes from participant responses.

Themes	Sub-themes	Quotes
1. **HPV and Cervical Cancer Knowledge**	(a) Knowledge of HPV	I. It is the virus that affects the cervix of the human, thank you" (School D, participant 5). II. It is in the female cervix" (School A, participant 2)
	(b) Transmission	I. Usually, you get cervical cancer from engaging in pre-marital sex" (School C, participant 5).
	(c) Knowledge of symptoms or consequences	I. The person will get cervical cancer" (School C, number 3). II. The person may get throat cancer" (School C, number 7). III. Since it is the end of the uterus, it links the womb to the vagina, it can cause damage to the womb" (School C, number 8). IV. It goes along with damage to the womb" (School C, number 13). V. It affects the menstrual cycle of females" (School C, number 5). VI. If a person is a female, the person may have complications when giving birth (School D, number 5).
2. **Knowledge about HPV vaccination**	(a) Vaccine similarities to other vaccines.	I. Vaccinations are a sort of like a weak form of the bacteria so when like when it's introduced into the immune system, it helps the immune system fight against the… it makes the immune system stronger" (School D, number 10). II. It boosts the immune system to fight against diseases" (School D, number 2). III. It helps the immune system" (School C, number 3).
	(b) Knowledge of Other Vaccines	I. I know of anti-rabies vaccine" (School A, number 6). II. I know Hepatitis A and B vaccine" (School A, numbers 9).
	(c) Number of shots	I. 3 times" (School C, number 3). II. 2 times" (School C, numbers 4,5,10). III. Once" (School B, number 15).

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	(d) Target population for Vaccine (male/female)	I. Children" (School A, students collectively). II. Since this is a disease that affects women, I think women should be vaccinated" (School D, number 2). III. I also think the vaccine should be made on the females" (School D, number 9). IV. Men" (School B, number 14). V. especially the adolescent" (School B, number 12). "VIII-Any adolescent female qualifies to be vaccinated" (School D, number 8).
	(d) Age criteria for eligibility	I. 11 to 12" (School A, number 5). II. 14 to 45" (School A, number 2). III. I think from 14 to 90 years" (School D, number 10). IV. from 6 to 25" (School C, number 3). V. From 13 years to maybe when a person reaches menopause" (School D, number 8). VI. I think when the adolescent female immediately begins menstrual cycle" (School D, number 5).
3. **HPV Vaccination Barriers**	(a) Personal • Side effects (e.g., pain, fear of injection, potential death), • Misconceptions (e.g., infertility),	I. It has side effects such as maybe you can get other diseases" (School A, number 4). II. Vaccination can make you grow lean (School C, number 7). III. It can give us infection in our skin" (School B, number 1). IV. It can cause dizziness" (School B, number 5). V. It may destroy your womb (School C, number 9). VI. Become weak (School C, number 10). VII. You feel pains" (School B, number 6). VIII. The fear of injection" (School B, number 1).
	(b) Socio-cultural • Parental effects (e.g., lack of knowledge,	I. Some of our parents are uneducated on the vaccine, so if I told my mom I wanted to take it, she might be like, "Why are you going to take the vaccine?" (School D, number 5). II. My parents should accept and allow me to take the vaccine" (School B, number 17).

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	unwillingness to accept vaccine), • Culture of no routine checkup (e.g., not sick, doesn't need it), • Belief in traditional medicine • Religious beliefs	III. If you are not sick, there is no reason for you to go see" (School A, number 1). IV. There are no symptoms to show that something is wrong" (School A, number 7). V. I will not take it because my doctor hasn't told me I have the virus or no recommendation from doctor VI. I will not take it. I haven't done any check-ups to show that I have the virus VII. They should take me to the hospital for a doctor to check whether I have it" (School C, number 7). VIII. When you are sick, they will tell you to go for herbal medicines; I stopped going to the hospital because the drugs from those people are not that effective" (School A, number 2). IX. Maybe it is going to be a waste of time when you are not sick, and you are going to the doctor" (School A, number 3). X. When people speak bad things about the vaccine XI. I think religion should be set aside so we can receive the vaccine any time
	(c) Structural • Vaccine cost • No national vaccine policy	I. The high cost of the vaccine and no Money" (School B, number 7). II. Cancer treatment can be very costly, so people with financial problems may decide not to take 2 doses" (School D, number 6). III. The country should accept the vaccine" (School B, number 11). "IV- If the country doesn't accept it, I can't take it" (School B, number 17). IV. I think it all starts with the government. They should provide us help with such resources to partake in that activity" (School D, number 5). V. There are some organizations that are in charge of that, such as Breast Cancer International. They should come to the school where girls can freely talk to them about their problems, and vaccination can be done very well" (School D, number 13).
4. **HPV Vaccination Facilitators**	(a) Personal • Vaccine effectiveness • Protection against the virus	I. I think the vaccination is effective to prevent the virus from developing" (School A, number 15). II. It would help prevent the disease, and related ones" (School D, number 11). III. It will protect us from the virus" (School B, number 16). IV. I'm very much prepared because if I don't get a vaccination earlier, maybe it can result in getting HPV later in my late ages." (School D, number 12). V. I will because it will protect me from getting cancer" (School C, number 10).

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	(b) Social-cultural • Normative beliefs (e.g., parents, doctors, and friends) • Vicarious effects • Altruistic effect	I. I will take it when I see someone who has taken the vaccine and it has helped the person" (School C, number 3). II. When I see someone who has taken it already and did not suffer any harmful effect" (School C, number 5). III. I think parents have to talk to us, because I think some people are afraid to get vaccination because they think people will view them as bad children. Usually, you get cervical cancer from engaging in pre-marital sex. IV. I will take it because I do not want to give the virus to another person (School C, number 9)
	(c) Structural • Financial support • Availability of vaccine • Policies about school-based education	I. Financial support from the government (School A, number 1). There should be government policies to accept the vaccine nationally (School D, number 4) II. Availability of the vaccine at the hospitals III. I think vaccination should be done in school, mainly the girl's school, so that we can get in touch with the girls very well" (School D, number 15). IV. Available in hospitals" (School A, number 8). V. I think the hospitals would be the best place to go" (School D, number 13).
5. **Access to Health Information**	(a) Parent communication	I. Participants in all groups reported no information or communication from their parents about HPV infection, the vaccination, and/or cervical cancer II. I will tell them [parents] that I have been taught in school that I need to take the vaccine to protect myself from getting HPV infection
	(d) Awareness Campaigns (TV news)	I. I heard it on television, they were trying to create awareness for cervical cancer" (School D, number 5). II. I heard it on the news (School B, number 5)
	(e) Exposure to School-Based Health Education	I. There should be public education about the necessity of the vaccination" (School A, number 4). II. … I have heard it before, but it was in a seminar which was organized in the school" (School D, number 8). III. I also heard it [vaccination] in my school … They came to our dining hall, so I also learned from that (School D, number 9).

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3.3. Knowledge About HPV and Cervical Cancer

The adolescent students' overall knowledge about HPV and cervical cancer was very low, with the majority (over 80%) of students admitting that they had not heard anything about HPV. However, a few of the students knew about HPV and its association with cervical cancer and other cancers. Some participants identified HPV as a virus that affects the cervix of the female reproductive organ (table 2, quote 1a I-II) and that HPV was sexually transmitted (table 2, quote 1b I). A few adolescent students said women's wombs could be damaged because of HPV infection since the cervix is a link between the vagina and the womb (1c III-IV). Others also said HPV infection can cause complications in menstruation (1c V) and affect women's ability to give birth (1c VI).

3.4. Knowledge About HPV Vaccination

We assessed adolescent students' general knowledge about the HPV vaccine, focusing on its similarities to other vaccines, the recommended dosage schedule, the target population (male/female), and the age criteria for eligibility. Most participants (65%) understood how the HPV vaccine works based on their knowledge of other childhood vaccines. Participants described that HPV vaccines contain weakened forms of the virus and boost the immune system to combat it. Participants were also divided on the dosage regimen: some mentioned a 3-dose schedule, while others believed it required two or a single dose (2c I – III). However, participants demonstrated varied understanding regarding HPV vaccination eligibility. While some identified the target population as adolescent males and females, their responses about age eligibility ranged widely, including ages 11–12, 14–45, 6–25, and even 14–90 (2d I-IV). Others tied HPV vaccination eligibility to life stages, such as the beginning of menstruation or age 13 through menopause (2d V-VI).

3.5. HPV Vaccination Barriers

The analysis revealed some of the participants were unwilling to be vaccinated. The participants identified personal, sociocultural, and structural level barriers that influenced their perceptions of the HPV vaccine. Personal level barriers to accepting the HPV vaccine include perceived side effects (e.g., pain, fear of injection, potential death) and misconceptions (e.g., infertility, "destroying the womb," growing lean) (3a I – VIII). The sociocultural level barriers include parental effects (e.g., lack of knowledge, unwillingness to accept vaccine), the culture of no routine checkup (e.g., no sick we don't need to go for check-ups), belief in traditional medicine, and religious beliefs (3b I – XI). The structural level barriers include the cost of vaccines and the lack of national policy requirements (3c I -V).

3.6. HPV Vaccination Facilitators

The analysis showed that about 80% reported that they were willing to accept HPV vaccination. The participants identified personal, sociocultural, and structural level factors that would influence them to receive the HPV vaccine. Personal factors include the vaccine effectiveness and their desire to protect themselves against the HPV virus (4a I–V). The socio-cultural factors include normative beliefs such as parental, doctor, and friend encouragement, vicarious effects (e.g., seeing somebody already vaccinated), and altruistic reasons (e.g., willingness to be vaccinated because of desire not to infect others with the virus) (3b I–IV). The structural factors include the government providing financial support or subsidizing vaccination costs, the availability of vaccines, and policies that include school-based vaccination programs (4c I -V).

3.7. HPV Vaccine Information Source

The analysis showed a lack of adolescent-parent communication about HPV vaccination, with many of the participants indicating that their parents had not discussed any HPV vaccination with them. However, some participants indicated that after receiving credible information about HPV vaccination, they would be willing to begin the conversations (5a I – II). Generally, very few of the

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participants heard about HPV through television awareness campaigns (5b I – II). Others got their HPV information from school-based programs such as seminars (5c I – II).

4. Discussion

The Human Papillomavirus (HPV) vaccine plays a crucial role in preventing cervical cancer. Understanding the primary target populations' perceptions of HPV vaccination is critical. This study examined adolescent students' knowledge of HPV and cervical cancer, their perceptions of the vaccine, and the factors influencing their willingness to be vaccinated. Key themes from the focus group discussions include general awareness of HPV and HPV vaccines, facilitators and barriers to HPV vaccines, and HPV vaccine information sources.

4.1. General Knowledge

Few participants recognized HPV as a cause of cervical cancer, reflecting findings from prior research indicating low awareness of HPV being the primary cause of cervical cancer [18,31–33]. This trend is common in LMICs, where many individuals, including adolescents, lack an understanding of HPV and its association with various cancers, including cervical cancer [34]. Even among those participants with some awareness of HPV as a causative agent of cervical cancer, misconceptions about HPV's broader effects—such as its link to other cancers and its transmission pathways—persist. These misunderstandings, highlighted in other studies, can diminish the perceived seriousness of HPV and undermine the importance of vaccination, ultimately hindering vaccine uptake [35,36]. These findings underscore the critical need for targeted educational campaigns to bridge knowledge gaps and improve awareness of HPV's broader health risks.

4.2. HPV Vaccination Facilitators

Approximately 80% of participants indicated they were willing to receive the HPV vaccine. We identified several individual-level factors that influenced their willingness to participate in vaccination, including the participants' beliefs in the vaccine's efficacy in protecting against HPV and related health issues. The participant's discussions implied that the more they get accurate information about the vaccine's effectiveness, the more likely they would accept the vaccination. This finding suggests that more public and school-based education is needed to create HPV vaccine awareness. The other personal factor that generated participants' interest in vaccination is their desire to protect themselves against the HPV virus and its potential consequences, such as cervical cancer. Perceived vaccine effectiveness and the desire for self-protection have been associated with vaccination behaviors [37].

We also identified that sociocultural factors such as normative beliefs, vicarious effects, and altruistic reasons could increase participants' willingness to accept the vaccines. Normative beliefs such as parental influence, trust in health professionals' recommendations, and the perceived credibility and effectiveness of school-based vaccination programs influenced adolescents' attitudes toward vaccines. This finding is consistent with the studies that found that adolescents trust health professionals' advice for vaccination [38].

Similar to other study findings [38], we found that parental power and influence heavily swayed HPV vaccination decisions for adolescents in our study. Although most participants believed in the vaccine's effectiveness, some expressed a need for peer validation, particularly from those who had already received the vaccine. This indicates that vicarious influences play a significant role in shaping vaccine confidence and acceptance. Participants appeared to rely on their peers' experiences, accounts, and observations to measure the vaccine's safety and benefits. These findings align with broader research suggesting that social proof—witnessing positive outcomes within one's social circle—can strengthen confidence in health interventions [39]. Addressing social norms or subjective norm dynamics in public health campaigns by highlighting stories of vaccinated individuals and fostering community-led advocacy could help bridge the gap between belief in effectiveness and vaccine acceptance.

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Contrary to our findings that school-based programs positively influenced participants' willingness to accept vaccines, a systematic review showed that some adolescents in those reviewed studies felt school-based vaccine education was insufficient to make informed vaccine decisions [40]. Nonetheless, as our study's findings suggest, targeted school-based programs could enhance adolescents' favorable attitudes toward vaccines.

Structural level facilitators: At the structural level, our study showed that factors such as financial support, vaccine availability, and policies to incorporate school-based HPV educational programs would encourage participants to accept HPV vaccination. Government subsidies or financial assistance to reduce vaccine costs could make vaccines more accessible. Vaccine availability, especially in communities and schools, as well as school-based vaccination programs and supportive policies, could create organized, convenient opportunities for vaccination. Participants' responses suggested that these structural factors could motivate them to accept the vaccine.

4.3. HPV Vaccination Barriers

Personal barriers are individual-level concerns and misconceptions that hinder vaccine acceptance. The findings from our study showed that perceived side effects of the HPV vaccine, such as fear of physical reactions like pain from the injection and anxiety about severe outcomes, including fear of death, are barriers to the HPV vaccine. Fear of side effects, a well-documented barrier in LMICs, is often fueled by widespread misinformation about vaccine safety [17,36].

Another personal barrier identified in our study is misconceptions about HPV vaccines. Our findings showed that some participants believed in the misinformation about infertility caused by the vaccine, myths about the vaccine causing harm to reproductive organs (e.g., "destroying the womb"), and beliefs that the vaccine could lead to changes in body shape, such as "growing lean." These findings confirmed other studies that reported concerns about HPV vaccine-associated infertility [41,42].

Our study showed that sociocultural factors were critical in shaping adolescents' attitudes or likelihood of accepting HPV vaccination. Our findings showed that sociocultural factors such as parental attributes, cultural norms, beliefs, traditional medicine, and religious beliefs were barriers to HPV vaccination. Our finding agrees with the other studies that found that parental attributes such as their lack of awareness or knowledge about vaccine and their unwillingness to vaccinate their children are the main barriers to vaccine acceptance [43,44].

Additionally, we found that cultural norms, such as the belief that medical check-ups (i.e., prevention measures such as vaccination) are unneeded unless someone is sick, influenced adolescents' attitudes toward vaccines. This belief in “no sick” and “no check-up” practices can perpetuate a misguided belief system that contradicts preventive medicine principles, which emphasize early intervention and proactive health management [45,46]. By fostering reliance on reactive or symptomatic care, individuals may develop a sense of complacency, believing that seeking medical help (e.g., health screening, vaccination) is unnecessary unless visible symptoms arise [45,46]. Society-level education and public policies are needed to address reactive care practices and increase the promotion of preventive care practices, including HPV vaccination.

Another sociocultural barrier identified in our study is the participant's beliefs in traditional medicine. Beliefs in traditional medicine can shape attitudes toward health interventions and preventive care and can either facilitate or hinder vaccine acceptance [47]. In this study, we found that a belief in traditional medicine negatively affected adolescents' views on hospitals and vaccination, as some of the participants in our study implied that traditional medicine is better than modern medicine. The use of traditional medicine in most LMICs is based on cultural familiarity, accessibility, and affordability, and these traditional practices often serve as the first line of treatment for many communities, particularly in rural and underserved areas [48,49]. Despite traditional medicine's importance, efforts should be made to harmonize traditional and modern medicine in ways that preserve cultural identity while ensuring patient safety and optimal health outcomes.

In our study, concerns such as HPV vaccine cost and lack of national policy requirements were noted as barriers to vaccine acceptance. Our findings on vaccine cost as a vaccine barrier are in

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agreement with the other studies that, in many LMICs, the high cost of HPV vaccines is a significant deterrent to widespread adoption [20]. Families and individuals often have to pay out-of-pocket, making the vaccines inaccessible to those in lower socioeconomic brackets. While organizations like Gavi and the Vaccine Alliance have helped reduce costs by negotiating lower prices for LMICs, coverage remains uneven [50,51]. Addressing vaccine affordability is important to avoid higher long-term costs resulting from the treatment and management of cervical cancer. Another structural barrier is the lack of national policy requirements. Policies integrating HPV vaccination into routine immunization schedules have effectively increased coverage in several countries [52]. Rwanda's comprehensive national policy on HPV vaccination achieved high vaccination rates by targeting young girls through schools and community outreach efforts [53], which could be a model for other LMICs, including Ghana.

4.4. HPV Vaccine Information Source

Another notable finding of our study was the participants' source of HPV vaccine information, with many of the participants reporting that their parents had no communication about HPV infection, vaccination, and/or cervical cancer with them. The lack of discussions about HPV vaccination between parents and adolescents may stem from parental unawareness or discomfort in discussing topics related to sexual health, which HPV vaccination often implies [54,55]. Contrary to the findings of other studies that showed that adolescents felt embarrassed discussing sexually related education with their parents [56,57], the adolescent participants in this study expressed a willingness to initiate conversations about HPV vaccination with their parents if provided with accurate information about the vaccine. Evidence shows that parent-adolescent engagement and open discussions influence adolescents' vaccination acceptance [40,58]. Our findings revealed that a few participants accessed HPV vaccine information through TV and school seminars. However, the fact that a few of the participants were exposed to TV campaigns highlights a missed opportunity. Media campaigns can effectively spread awareness to large audiences, especially in areas with limited health education resources. Tailoring these campaigns to cultural and age-specific needs can help address misconceptions about the vaccine. Schools are also vital for health education, particularly in low- and middle-income countries. Seminars and school programs can provide direct information to adolescents and indirectly influence their parents [58]. To enhance their impact, schools could include HPV education in health curriculums, involve parents in the process, and work with local healthcare providers to run vaccination programs.

Limitations: This study has a few limitations. The major limitation of this study was the participants' low baseline knowledge of HPV and the vaccine. Many adolescents had little to no prior understanding of the HPV virus, requiring us to provide some basic education during focus group discussions to ensure participants could engage in informed dialogue. Determining whether participants' responses reflected their perceptions or the information they had just learned was challenging, complicating data analysis. However, the majority of the participants were aware of other childhood (e.g., malaria vaccine) vaccinations. As a result, they drew their responses from their experiences with other vaccinations.

Additionally, the sample size composition was a limitation. Although the study involved 59 participants, the sample was predominantly female (84.75%), which could limit the representativeness of the findings, especially concerning male adolescents' perceptions of the HPV vaccine. Given that HPV affects both males and females, future studies would benefit from a more gender-balanced sample to capture a broader range of perspectives. Again, the geographic scope of the study was limited to a few schools in the capital city of the Ashanti Region of Ghana, which may not fully reflect the knowledge and attitudes of adolescents from other regions, particularly those in more rural or underserved areas.

Another limitation is the potential for social desirability bias due to the face-to-face nature of the focus group discussion, where participants may feel pressured to give socially acceptable responses during group discussions on sensitive topics like sexual health and vaccination. This desirability bias could lead to underreporting of vaccine hesitancy or concerns, making it harder to assess

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misconceptions about the HPV vaccine accurately. To minimize social desirability, the focus group facilitators continually encouraged participants to speak their minds and emphasized the need for the study participants not to discuss any issues raised during the focus group discussions with anybody. We also assured participants that their responses would remain confidential and that all data would be anonymized. Additionally, focus group discussion is at risk of allowing more outspoken adolescents to dominate the discussions, while introverted students may feel uncomfortable and hesitate to share their experiences. However, we used a round-robin format during the focus group discussions to ensure every participant had an opportunity to speak.

Finally, the absence of data from parents, who play a critical role in the decision-making process for vaccination, represents a significant limitation of this study. Parents are often the primary decision-makers regarding their children's healthcare, including vaccinations. Understanding their perspectives, beliefs, and concerns would provide a more holistic view of the factors influencing HPV vaccination uptake. Nevertheless, the insights gained from this study into the factors that affect adolescents' likelihood of accepting the HPV vaccination are valuable. These findings can inform the design of future interventions to foster effective parent-adolescent communication about HPV vaccination.

Strengths: Despite these limitations, the study had several strengths. One notable strength was the use of focus group discussions, which allowed for an in-depth understanding of adolescents' knowledge and perceptions of HPV and the vaccine. Focus groups created an environment where participants could engage in meaningful conversations, pose questions, and voice their concerns, ultimately leading to a better understanding of the socio-cultural and structural factors that shape their attitudes toward vaccination.

Another strength of the study was the diversity of the sample, which comprised adolescents from four different schools in the Ashanti Region. While the sample had limitations regarding gender imbalance, including participants from various schools offered a broader perspective on the factors affecting vaccine uptake in Ghana. This diversity enhances the applicability of the findings to similar populations in other regions.

A third strength of the study was its focus on understanding the socio-cultural and context-specific factors that influence adolescents' attitudes toward the HPV vaccine. By exploring the primary target populations' perceptions of HPV vaccination, the study provided comprehensive factors that shape vaccine decision-making in this population. Despite challenges in the data collection and analysis processes resulting from participants' limited prior knowledge, the findings highlight the need to enhance health literacy and address the sociocultural barriers that impede vaccine acceptance. These results can inform future interventions to increase HPV vaccination rates in Ghana and other LMICs.

The findings of this study have several important implications for public health initiatives aimed at increasing HPV vaccination rates among adolescents in Ghana. First, the significant knowledge gaps regarding HPV and its vaccine highlight the urgent need for comprehensive educational campaigns specifically designed for adolescent students. These campaigns should focus on clarifying misconceptions about HPV and its link to cervical cancer, as well as emphasizing the importance of vaccination for both genders. Public health messages must also address common concerns about vaccine safety, side effects, and costs to alleviate fears that may hinder vaccine uptake [17].

Furthermore, the study highlights healthcare professionals' vital role in promoting vaccine acceptance among adolescents. Providing training for healthcare providers to effectively communicate the benefits of the HPV vaccine and address parental concerns can build trust and facilitate informed decision-making. Strengthening school health programs to incorporate structured health education on HPV and the vaccine can transform schools into key centers for health promotion. Additionally, policymakers should consider integrating HPV vaccination into existing school health initiatives, as these programs can help normalize discussions around sexual health and provide easy access to vaccinations [18]. By implementing these strategies, Ghana can make significant progress toward increasing HPV vaccination rates and reducing the incidence of HPV-related cancers.

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5. Conclusion

This study highlights significant gaps in adolescents' knowledge and perceptions of the HPV vaccine in Ghana. Despite its proven benefits in preventing cervical cancer, awareness of the vaccine remains low, contributing to low vaccination rates. Socio-cultural factors, such as the role of healthcare professionals and the need for parental consent, must be addressed through targeted education and advocacy. Schools can serve as effective platforms for health education, and integrating HPV vaccination into routine healthcare services can boost uptake. These efforts are essential to reducing HPV-related cancers and ensuring a healthier future for Ghanaian youth.

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